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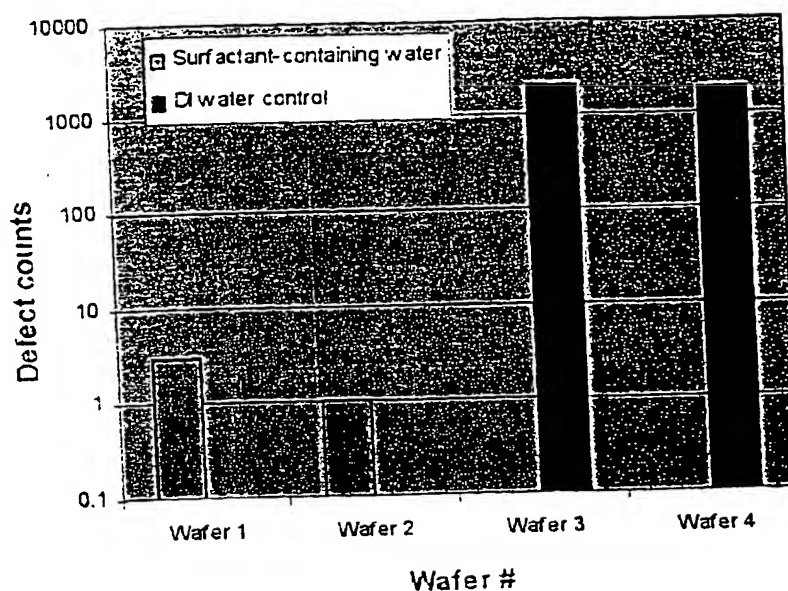
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For two-letter codes and other abbreviations, refer to the "Guid-  
ance Notes on Codes and Abbreviations" appearing at the begin-  
ning of each regular issue of the PCT Gazette.

(54) Title: A METHOD TO REDUCE POST-DEVELOPMENT DEFECTS WITHOUT SACRIFICING THROUGHPUT



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(57) Abstract: Post-development defects in the manufacture of semiconductor devices through the use of surfactants incorporated in the rinse water or the developer for the resist. The surfactants effectively remove resist defects in or around the resist pattern without attacking the resist itself.

# INTERNATIONAL SEARCH REPORT

International Application No  
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 543 268 A (KOMANO HIROSHI ET AL) 6 August 1996 (1996-08-06) claims; examples ---	1,12
X	US 5 164 286 A (BLAKENEY ANDREW J ET AL) 17 November 1992 (1992-11-17) claims ---	1,12
X	US 5 731 132 A (ELTGEN MARLIES ET AL) 24 March 1998 (1998-03-24) column 2, line 23 - line 28; claims; examples ---	1,12
X	US 4 824 769 A (LEWIS JAMES M ET AL) 25 April 1989 (1989-04-25) claims; examples ---	1,12
X	US 4 613 561 A (LEWIS JAMES M) 23 September 1986 (1986-09-23) claims; examples ---	1,12
X	US 5 977 041 A (HONDA KENJI) 2 November 1999 (1999-11-02) claims; examples ---	15
P,X	US 6 136 514 A (PHAN KHOI A ET AL) 24 October 2000 (2000-10-24) column 4, line 1-64; claims ---	1,15-17
P,X	WO 01 63365 A (SHIPLEY CO LLC) 30 August 2001 (2001-08-30) claims; examples -----	1,12,15

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International Application No  
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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 G03F7/32 C11D11/00 G03F7/40

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, CHEM ABS Data

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 852 743 B (CLARIANT INT LTD) 17 January 1999 (1999-01-17) claims; examples ---	1-3,12, 13,15-17
X	US 5 741 628 A (ENDO MASAYUKI ET AL) 21 April 1998 (1998-04-21) column 15, line 30 - line 46 column 16, line 55 -column 17, line 10 ---	1-4,9,15
X	US 5 286 606 A (RAHMAN M DALIL ET AL) 15 February 1994 (1994-02-15) claims; examples ---	1,12
X	WO 99 53381 A (ETEC SYSTEMS INC) 21 October 1999 (1999-10-21) claims --- -/--	1,12

☒ Further documents are listed in the continuation of box C.

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P,X	WO 01 63365 A (SHIPLEY CO LLC) 30 August 2001 (2001-08-30) claims; examples -----	1,12,15

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/42148

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0852743	B	15-07-1998	US 5750031 A	12-05-1998
			DE 69605207 D1	23-12-1999
			DE 69605207 T2	13-07-2000
			EP 0852743 A1	15-07-1998
			JP 11512845 T	02-11-1999
			CN 1196806 A	21-10-1998
			WO 9712281 A1	03-04-1997
US 5741628	A	21-04-1998	EP 0691674 A2	10-01-1996
			EP 0883163 A2	09-12-1998
			JP 9230606 A	05-09-1997
			JP 2656913 B2	24-09-1997
			JP 8076385 A	22-03-1996
			KR 174316 B1	01-04-1999
			US 5658711 A	19-08-1997
			US 5679500 A	21-10-1997
US 5286606	A	15-02-1994	DE 69308326 D1	03-04-1997
			DE 69308326 T2	15-01-1998
			EP 0677183 A1	18-10-1995
			HK 70897 A	06-06-1997
			JP 8505241 T	04-06-1996
			SG 47545 A1	17-04-1998
			WO 9415262 A1	07-07-1994
WO 9953381	A	21-10-1999	AU 3386599 A	01-11-1999
			EP 0991983 A1	12-04-2000
			WO 9953381 A1	21-10-1999
			US 6107009 A	22-08-2000
			US 6200736 B1	13-03-2001
US 5543268	A	06-08-1996	US 6329126 B1	11-12-2001
US 5164286	A	17-11-1992	NONE	
US 5731132	A	24-03-1998	DE 4419166 A1	07-12-1995
			CN 1117599 A	28-02-1996
			DE 59508636 D1	21-09-2000
			EP 0685767 A1	06-12-1995
			JP 7333863 A	22-12-1995
			SG 34226 A1	06-12-1996
US 4824769	A	25-04-1989	US 4670372 A	02-06-1987
			CA 1265373 A1	06-02-1990
			DE 3580443 D1	13-12-1990
			EP 0178496 A2	23-04-1986
			JP 1851404 C	21-06-1994
			JP 5062984 B	09-09-1993
			JP 61097652 A	16-05-1986
			KR 8900803 B1	07-04-1989
US 4613561	A	23-09-1986	CA 1261194 A1	26-09-1989
			CN 85107347 A	20-08-1986
			DE 3576742 D1	26-04-1990
			EP 0178495 A2	23-04-1986
			JP 1863222 C	08-08-1994
			JP 5073227 B	13-10-1993
			JP 61097653 A	16-05-1986

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 01/42148

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4613561	A	KR 8900804 B1	07-04-1989
US 5977041	A	02-11-1999	
		AU 9497398 A	12-04-1999
		EP 1017770 A1	12-07-2000
		JP 2001517728 T	09-10-2001
		WO 9915609 A1	01-04-1999
US 6136514	A	24-10-2000	
		US 6251570 B1	26-06-2001
WO 0163365	A	30-08-2001	
		AU 3869601 A	03-09-2001
		WO 0163365 A1	30-08-2001
		US 2002001780 A1	03-01-2002